CLAIMS

What is claimed is:

1. A method of constructing one or more patterned lipid bilayer; the method comprising:

i) providing at least a first lipid bilayer;

ii) providing one or more source of UV light;

iii) providing one or more patterned UV-opaque mask between the source of UV light and the at least first lipid bilayer, which patterned UV mask comprises one or more UV-transparent area at one or more specific location in the UV mask; and,

iv) exposing the at least first lipid bilayer to the UV light through the one or more patterned UV-opaque mask, thereby constructing at least one patterned lipid bilayer, which patterned lipid bilayer comprises one or more non-lipid area corresponding to the one or more UV-transparent area in the UV mask.

2. The method of claim 1, wherein the at least first lipid bilayer is selected from the group consisting of: a supported lipid bilayer, a tethered lipid bilayer, a polymer-cushioned lipid bilayer, a lipid bilayer comprising proteins in a proteo-lipidic mixture, and a hybrid lipid bilayer comprising an outer lipid layer and an inner self-assembled monolayer.

3. The method of claim 1, wherein the at least first lipid bilayer comprises a planar lipid bilayer.

4. The method of claim 1, wherein the at least first lipid bilayer comprises a non-planar lipid bilayer.

5. The method of claim 4, wherein the non-planar lipid bilayer comprises a spherical lipid bilayer, a cylindrical lipid bilayer, or a selected three-dimensional lipid bilayer.

6. The method of claim 1, wherein the first lipid bilayer comprises a bilayer supported on a planar substrate or a bilayer supported on a non-planar substrate.

7. The method of claim 1, wherein the lipid bilayer comprises a first lipid layer and at least a second lipid layer.

8. The method of claim 7, wherein the first layer and the second layer comprise substantially similar lipid profiles, identical lipid profiles, or different lipid profiles.

9. The method of claim 7, wherein at least one of the first or second layers comprises a synthetic lipid layer.

10. The method of claim 1, wherein the one or more source of UV light comprises an adjustable source of UV light.

11. The method of claim 1, wherein the one or more source of UV light comprises a tungsten-halogen lamp, a xenon-arc lamp, a mercury lamp, or an excimer laser.

12. The method of claim 1, wherein the one or more source of UV light emits UV light of a wavelength from between about 184 nm to about 257 nm.

13. The method of claim 1, wherein the patterned UV-opaque mask comprises a plurality of UV-transparent areas.

14. The method of claim 13, wherein the patterned UV-opaque mask comprises from about 144 to about 2200 UV-transparent areas per square centimeter, from about 200 to about 1500 UV-transparent areas per square centimeter, or from about 500 to about 1000 UV-transparent areas per square centimeter.

15. The method of claim 1, wherein the UV-transparent area comprises one or more length or width dimension of from about 5 millimeters to about 0.1 micrometers or less.

16. The method of claim 15, wherein the one or more length or width dimension comprises from about 2 millimeters to about 0.5 micrometers or less; from

about 1 millimeter to about 1 micrometers or less; from about 500 micrometers to about 5 micrometers or less; from about 250 micrometers to about 10 micrometers or less; from about 100 micrometers to about 15 micrometers or less; or from about 75 micrometers to about 25 micrometers or less.

17. The method of claim 1, wherein the one or more non-lipid areas are contiguous non-lipid areas.

18. A patterned lipid bilayer membrane constructed according to the method of claim 1.

19. A method of constructing one or more modified lipid bilayer, the method comprising:

i) providing at least a first primary lipid bilayer;

ii) providing one or more source of a UV light ;

iii) providing one or more patterned UV-opaque mask between the source of UV light and the primary lipid bilayer, which patterned UV mask comprises one or more UV-transparent area at one or more specific location in the UV mask;

iv) exposing the primary lipid bilayer to the UV light through the one or more patterned UV-opaque mask, thereby constructing one or more patterned lipid bilayer, which patterned lipid bilayer comprises one or more non-lipid area corresponding to the one or more UV-transparent area in the UV mask;

v) providing at least a first secondary lipid bilayer; and,

vi) contacting the one or more patterned lipid bilayer with the at least first secondary lipid bilayer, which at least first secondary lipid bilayer localizes within the one or more non-lipid area in the patterned lipid bilayer.

20. The method of claim 19, wherein the at least one UV mask comprises a plurality of UV masks and wherein the at least first secondary lipid bilayer comprises a plurality of secondary lipid bilayers.

21. The method of claim 20, wherein substantially each member of the plurality of UV masks comprises a different pattern, and wherein substantially each member of the plurality of secondary lipid bilayers comprises a different secondary lipid bilayer; further comprising:

vii) repeating steps i-vi for substantially all members of the plurality of UV masks and for substantially all members of the plurality of secondary lipid bilayers, thereby creating one or more modified primary lipid bilayer containing a plurality of different secondary lipid bilayers.

22. The method of claim 19 or 21, wherein the first primary lipid bilayer is selected from the group consisting of: a supported lipid bilayer, a tethered lipid bilayer, a polymer-cushioned lipid bilayer, a lipid bilayer comprising proteins in a proteo-lipidic mixture, and a hybrid lipid bilayer comprising an outer lipid layer and an inner self-assembled monolayer.

23. The method of claim 19 or 21, wherein the first primary lipid bilayer comprises a planar lipid bilayer.

24. The method of claim 19 or 21, wherein the first primary lipid bilayer comprises a non-planar lipid bilayer.

25. The method of claim 24, wherein the non-planar lipid bilayer comprises a spherical lipid bilayer, a cylindrical lipid bilayer, or a selected three-dimensional lipid bilayer.

26. The method of claim 19 or 21, wherein the first lipid bilayer comprises a bilayer supported on a planar substrate or a bilayer supported on a non-planar substrate.

27. The method of claim 19 or 21, wherein the first primary lipid bilayer comprises a first lipid layer and at least a second lipid layer.

28. The method of claim 27, wherein the first layer and the second layer comprise substantially similar lipid profiles, identical lipid profiles, or different lipid profiles.

29. The method of claim 27, wherein at least one of the first or second layers comprises a synthetic lipid layer.

30. The method of claim 19 or 21, wherein the one or more source of UV light comprises an adjustable source of UV light.

31. The method of claim 19 or 21, wherein the one or more source of UV light comprises a tungsten-halogen lamp, a xenon-arc lamp, a mercury lamp, or an excimer laser.

32. The method of claim 19 or 21, wherein the one or more source of UV light emits UV light of a wavelength from between about 184 nm to about 257 nm.

33. The method of claim 19 or 21, wherein the patterned UV-opaque mask comprises a plurality of UV-transparent area.

34. The method of claim 33, wherein the patterned UV-opaque mask comprises from about 144 to about 2200 UV-transparent areas per square centimeter, from about 200 to about 1500 UV-transparent areas per square centimeter, or from about 500 to about 1000 UV-transparent areas per square centimeter.

35. The method of claim 19 or 20, wherein the UV-transparent area comprises one or more length or width dimension of from about 5 millimeters to about 0.1 micrometers or less.

36. The method of claim 35, wherein the one or more length or width dimension comprises from about 2 millimeters to about 0.5 micrometers or less; from about 1 millimeter to about 1 micrometers or less; from about 500 micrometers to about 5 micrometers or less; from about 250 micrometers to about 10 micrometers or less; from

about 100 micrometers to about 15 micrometers or less; or from about 75 micrometers to about 25 micrometers or less.

37. The method of claim 19 or 20, wherein the at least first secondary lipid bilayer comprises one or more of: a lipid raft, a lipid-coated bead, a liposome, a lipid vesicle, a polymerizable lipid, or a proteo-liposome.

38. The method of claim 19 or 20, wherein the first secondary lipid bilayer and the first primary lipid bilayer comprise substantially similar lipid bilayers, identical lipid bilayers, or different lipid bilayers.

39. The method of claim 38, wherein the at least first secondary lipid bilayer comprises a different lipid profile than the lipid profile of the first primary lipid bilayer, wherein the at least first secondary lipid bilayer comprises a different amount of proteins than the first primary lipid bilayer, wherein the at least first secondary lipid bilayer comprises a different type of proteins than the first primary lipid bilayer, wherein the at least first secondary lipid bilayer comprises a different lipid diffusion coefficient than the first primary lipid bilayer, or wherein the at least first secondary lipid bilayer comprises a different amount of cholesterol than the first primary lipid bilayer.

40. The method of claim 19 or 21, wherein the one or more non-lipid areas are contiguous non-lipid areas.

41. A modified lipid bilayer constructed according to the method of claim 19 or 20.

42. A method of constructing one or more chimeric lipid bilayer, the method comprising:

i) providing at least a first lipid bilayer;

ii) providing one or more source of UV light;

iii) providing one or more patterned UV-opaque mask between the source of UV light and the at least first lipid bilayer, which patterned UV mask comprises one or more UV-transparent area at one or more specific location in the UV mask;

iv) exposing the at least first lipid bilayer to the UV light through the one or more patterned UV-opaque mask, thereby constructing at least one patterned lipid bilayer, which patterned lipid bilayer comprises one or more non-lipid area corresponding to the one or more UV-transparent area in the UV mask;

v) providing at least a first secondary material; and,

vi) contacting the one or more patterned lipid bilayer with the at least first secondary material, which at least first secondary material localizes within the one or more non-lipid area in the patterned lipid bilayer.

43. The method of claim 42, wherein the at least one UV mask comprises a plurality of UV masks and wherein the at least first secondary material comprises a plurality of secondary materials.

44. The method of claim 43, wherein substantially each member of the plurality of UV masks comprises a different pattern, and wherein substantially each member of the plurality of secondary materials comprises a different secondary material; further comprising:

vii) repeating steps i-vi for substantially all members of the plurality of UV masks and for substantially all members of the plurality of secondary materials, thereby creating one or more chimeric lipid bilayer containing a plurality of different secondary materials.

45. The method of claim 42 or 44, wherein the first primary lipid bilayer is selected from the group consisting of: a supported lipid bilayer, a tethered lipid bilayer, a polymer-cushioned lipid bilayer, a lipid bilayer comprising proteins in a proteo-lipidic mixture, and a hybrid lipid bilayer comprising an outer lipid layer and an inner self-assembled monolayer.

46. The method of claim 42 or 44, wherein the first primary lipid bilayer comprises a planar lipid bilayer.

47. The method of claim 42 or 44, wherein the first primary lipid bilayer comprises a non-planar lipid bilayer.

48. The method of claim 47, wherein the non-planar lipid bilayer comprises a spherical lipid bilayer, a cylindrical lipid bilayer, or a selected three-dimensional lipid bilayer.

49. The method of claim 42 or 44, wherein the first lipid bilayer comprises a bilayer supported on a planar substrate or a bilayer supported on a non-planar substrate.

50. The method of claim 42 or 44, wherein the first primary lipid bilayer comprises a first lipid layer and at least a second lipid layer.

51. The method of claim 50, wherein the first layer and the second layer comprise substantially similar lipid profiles, identical lipid profiles, or different lipid profiles.

52. The method of claim 50, wherein at least one of the first layer or the second layer comprises a synthetic lipid layer.

53. The method of claim 42 or 44, wherein the one or more source of UV light comprises an adjustable source of UV light.

54. The method of claim 42 or 44, wherein the one or more source of UV light comprises a tungsten-halogen lamp, a xenon-arc lamp, a mercury lamp, or an excimer laser.

55. The method of claim 42 or 44, wherein the one or more source of UV light emits UV light of a wavelength from between about 184 nm to about 257 nm.

56. The method of claim 42 or 44, wherein the patterned UV-opaque mask comprises a plurality of UV-transparent areas.

57. The method of claim 56, wherein the patterned UV-opaque mask comprises from about 144 to about 2200 UV-transparent areas per square centimeter, from

about 200 to about 1500 UV-transparent areas per square centimeter, or from about 500 to about 1000 UV-transparent areas per square centimeter.

58. The method of claim 42 or 44, wherein the UV-transparent area comprises one or more length or width dimension of from about 5 millimeters to about 0.1 micrometers or less.

59. The method of claim 58, wherein the one or more length or width dimension comprises from about 2 millimeters to about 0.5 micrometers or less; from about 1 millimeter to about 1 micrometers or less; from about 500 micrometers to about 5 micrometers or less; from about 250 micrometers to about 10 micrometers or less; from about 100 micrometers to about 15 micrometers or less; or from about 75 micrometers to about 25 micrometers or less.

60. The method of claim 42 or 44, wherein the one or more non-lipid areas are contiguous non-lipid areas.

61. The method of claim 42 or 44, wherein the secondary material comprises one or more of: a cell, a protein, a glass bead, a latex bead, a bilayer coated bead, a membrane compatible amphiphilic polymer, a nanocrystal, a colloid, a quantum-dot material, a metal, a metal bead, or a polymerizable precursor molecule.

62. The method of claim 42 or 44, wherein the secondary material undergoes a spatially confined chemical reaction.

63. The method of claim 62, wherein the reaction comprises one or more of an electrochemical metal reduction, a polymerization, a protein-ligand reaction, or a cell-capture.

64. A chimeric lipid bilayer membrane constructed according to the method of claim 42 or 44.

65. A system or kit for construction of one or more patterned lipid bilayer membrane, the system or kit comprising:

i) one or more source of adjustable UV light;

ii) a source of one or more primary lipid bilayer membrane;

iii) one or more UV-opaque mask positioned between the UV light and the primary lipid bilayer membrane, which mask comprises one or more UV transparent area; and,

iv) one or more module for controllably positioning the lipid bilayer membrane in relation to the UV-opaque mask and the UV light.

66. A system or kit for construction of one or more modified or chimeric lipid bilayer membrane, the system or kit comprising:

i) one or more source of adjustable UV light;

ii) a source of one or more primary lipid bilayer membrane;

iii) one or more source of one or more refunctionalization component;

iv) one or more UV-opaque mask positioned between the UV light and the primary lipid bilayer membrane, which mask comprises one or more UV transparent area; and,

v) one or more module for controllable positioning the lipid bilayer membrane in relation to the UV-opaque mask and the UV light.

67. The system or kit of claim 65 or 66, further comprising one or more source of one or more lipid bilayer membrane buffer.

68. The system or kit of claim 65 or 66, further comprising a timer device, which device selectably controls the UV light.

69. The system or kit of claim 65 or 66, further comprising one or more device for controllably positioning the UV mask in relation to the UV light and the lipid bilayer membrane.

70. The system or kit of claim 65 or 66, further comprising one or more of: packaging materials, instructions for using the system to produce one or more patterned lipid bilayer membrane, modified lipid bilayer membrane, or chimeric lipid

bilayer membrane, and one or more container for holding one or more component of the system or kit.

71. A system or kit for making one or more patterned, modified, or chimeric lipid bilayer membrane, the kit comprising:

i) one or more lipid bilayer membrane;

ii) one or more UV-opaque mask, which mask comprises one or more UV transparent area;

iii) instructions for constructing a patterned lipid bilayer by selectively exposing the lipid bilayer to UV light passing through the mask; and,

iv) instructions for optional refunctionalization of the patterned lipid bilayer with one or more refunctionalization component to create one or more modified or chimeric lipid bilayer membrane.

72. The system or kit of claim 71, further comprising one or more adjustable UV light.

73. The system or kit of claim 72, further comprising one or more timer device which selectably controls the UV light.

74. The system or kit of claim 71, further comprising one or more of: packaging materials, and one or more containers for holding one or more component of the kit.

75. The system or kit of claim 71, further comprising one or more lipid bilayer membrane buffer.

76. The system or kit of claim 71, further comprising one or more module for controllably positioning the UV mask in relation to the UV light and the lipid bilayer membrane.

77. The system or kit of claim 66 or 71, wherein the kit comprises an environmental monitoring system or kit for detecting or classifying one or more

environmental moiety, wherein the one or more refunctionalization component binds to or otherwise indicates the presence of the one or more environmental moiety.

78. The system or kit of claim 77, wherein the environmental moiety comprises one or more of: a bacteria, a bacterial toxin, a virus, a prion, a fungus, a fungal toxin, or a chemical agent.

79. The system or kit of claim 78, wherein the environmental moiety comprises one or more of: *Bacillus anthracis*, *Clostridium botulinum*, *Clostridium botulinum* toxin, *Yersinia pestis*, *Variola* major, *Francisella tularensis*, Hemorrhagic fever, a Filovirus, an Arenoviruses, Ebola virus, Marburg virus, Lassa virus, Machupo virus, a Hanta virus, *Coxiella burnetii*, a brucellosis causing bacterium, epsilon toxin of *Clostridium perfringens*, a Salmonella species, *Escherichia coli* 0157:H7, Shigella, *Burkholderia mallei*, *Burkholderia pseudomallei*, *Chlamydia psittaci*, ricin toxin, Staphylococcal enterotoxin B, *Rickettsia prowazekii*, a viral encephalitis virus, an alphavirus, Venezuelan equine encephalitis virus, Eastern equine encephalitis virus, Western equine encephalitis virus, a flavivirus, St. Louis encephalitis virus, *Vibrio cholerae*, *Vibrio cholerae* toxin, *Cryptosporidium parvum*, Nipah virus, distilled mustard, Lewisite, mustard gas, nitrogen mustard, phosgene oxime, ethyldicholoarsine, Lewisite 1 (L-1), Lewisite 1 (L-2), Lewisite 1 (L-3), methyldichloroarsine, mustard/Lewisite, phenodichloroarsine, sesqui mustard, arsine, cyanogen chloride, hydrogen chloride, hydrogen cyanide, chlorine, diphosgene, cyanide, nitrogen oxide, perfluororisobutylene, phosgene, red phosphorous, sulfur trioxide-chlorosulfonic acid, teflon and perfluororisobutylene, titanium tetrachloride, zinc oxide, Agent 15, BZ, canniboids, fentanyls, LSD, phenothiazines, cyclohexyl sarin, GE, sarin, soman, tabun, VE, VG, V-gas, VM, VX, bromobenzylcyanide, chloroacetophenone, chloropicrin, CN in benzene and carbon tetrachloride, CN in chloroform, CN and chloropicrin in chloroform, CR, CS, adamsite, diphenylchloroarsine, diphenylcyanoarsine, or a fusarium toxin.

80. The system or kit of claim 77, wherein the refunctionalization component comprises one or more of an antibody against the environmental moiety, a specific protein which selectively binds to or otherwise indicates the presence of the environmental moiety, a specific membrane protein which selectively binds to or otherwise indicates the presence of the environmental moiety, a specific membrane lipid

which selectively binds to or otherwise indicates the presence of the environmental moiety, or a specific chemical element or compound which selectively binds to or otherwise indicates the presence of the environmental moiety.

81. The system or kit of claim 66 or 71, wherein the system or kit comprises a diagnostic system or kit for detecting or identifying one or more pathogen in an organism, wherein the one or more refunctionalization component binds to or otherwise indicates a presence of the one or more pathogen or of one or more pathogen-related moiety.

82. The system or kit of claim 81, wherein the pathogen comprises one or more of: a bacteria, a virus, a prion, a fungus, or an infectious parasite.

83. The system or kit of claim 81, wherein the one or more pathogen-related moiety comprises one or more of: an antibody of the organism against the one or more pathogen, a non-organism byproduct of the one or more pathogen, or a moiety produced by the organism in response to the one or more pathogen.

84. The system or kit of claim 66 or 71, wherein the system or kit comprises a screening system or kit for detecting or identifying one or more nucleic acid sequence in one or more genome, wherein the refunctionalization component binds to or otherwise indicates the presence of the one or more nucleic acid sequence.

85. The system or kit of claim 84, wherein the one or more nucleic acid sequence indicates a presence of one or more disease in an organism which comprises the one or more genome.

86. The system or kit of claim 85, wherein the disease is a congenital disease.

87. The system or kit of claim 84, wherein the one or more nucleic acid sequence comprises a plurality of nucleic acid sequences.

88. The system or kit of claim 84, wherein binding of the one or more nucleic acid sequence identifies one or more organism comprising the one or more genome of the one or more nucleic acid.

89. The system or kit of claim 66 or 71, wherein the system or kit comprises a drug profiling system or kit for detecting or identifying one or more drug within one or more organism, wherein the one or more refunctionalization component binds to or otherwise indicates a presence or prior presence of the one or more drug within the organism.

90. The system or kit of claim 89, wherein the one or more drug comprises one or more of: a cannaboid, cocaine, a barbiturate, methaqualone, sopor, parest, quaalude, mecquin, a benzodiazepine, chloral hydrate, phencyclidine, LSD, mescaline, peyote, psilocybin, DMY, DET, psilocyn, an amphetimine, an amphetimine derivative, heroin, codeine, morphine, an opiate, meperidine, hydromorphone, methadone, methamphetamines, or phenmetrazine.

91. The system or kit of claim 89, wherein the organism comprises a human.

92. The system of kit of claim 89, further comprising wherein the presence or prior presence of the one or more drug is detected or identified through examination of one or more of: blood, saliva, hair, skin, or mucus of the one or more organism.

93. The system of kit of claim 66 or 71, wherein the system or kit comprises a drug screening system or kit for identifying the effect or efficacy of one or more putative therapeutic or preventative drug on one or more organism, wherein the one or more refunctionalization component binds to or otherwise indicates the effect or efficacy of the putative drug.

94. The system or kit of claim 94, wherein the refunctionalization component comprises one or more moiety from the organism which is capable of interacting with one or more infectious agent or one or more product of one or more infectious agent.

95. The system or kit of claim 94, wherein the one or more putative drug binds to or alters the one or more infectious agent.

96. The system or kit of claim 93, wherein the one or more putative drug binds to or alters the one or more moiety of the organism.

97. The system or kit of claim 66 or 71, wherein the one or more refunctionalization component comprises one or more secondary lipid bilayer membrane, one or more non-lipid bilayer material, or one or more of: a cell, a protein, a glass bead, a latex bead, a bilayer coated bead, a membrane compatible amphiphilic polymer, a nanocrystal, or a polymerizable precursor molecule.

98. A controllably patterned lipid bilayer comprising a first and at least a second stable lipid-free emptied area, wherein an arrangement of the first and at least second stable lipid-free areas within the lipid bilayer comprises a micro-pattern, and wherein the lipid-free areas are not separated from the lipid bilayer areas by any physical barrier.

99. The lipid bilayer of claim 98, wherein the density of the lipid-free areas comprises from about 144 lipid-free areas per square centimeter of lipid bilayer to about 2200 or more lipid-free areas per square centimeter of lipid bilayer.

100. A modified lipid bilayer comprising a primary lipid bilayer and one or more secondary lipid bilayer, wherein one or more region of the secondary lipid bilayer is controllably localized within the primary lipid bilayer.

101. The modified lipid bilayer of claim 100, further wherein the primary lipid bilayer and the one or more secondary lipid bilayer are not separated by any physical barrier.

102. The modified lipid bilayer of claim 100, wherein the primary lipid bilayer is selected from the group consisting of: a supported lipid bilayer, a tethered lipid bilayer, a polymer-cushioned lipid bilayer, a lipid bilayer comprising proteins in a proteo-lipidic mixture, and a hybrid lipid bilayer comprising an outer lipid layer and an inner self-assembled monolayer.

103. The modified lipid bilayer of claim 100, wherein the one or more secondary lipid bilayer comprises one or more of: a lipid raft, a lipid-coated bead, a liposome, a lipid vesicle, a polymerizable lipid, or a proteo-liposome.

104. The modified lipid bilayer of claim 100, wherein the secondary lipid bilayer and the primary lipid bilayer comprise substantially similar lipid bilayers, identical lipid bilayers, or different lipid bilayers.

105. The modified lipid bilayer of claim 100, wherein the secondary lipid bilayer comprises a different lipid profile than the lipid profile of the primary lipid bilayer, wherein the secondary lipid bilayer comprises a different amount of proteins than the primary lipid bilayer, wherein the secondary lipid bilayer comprises a different type of proteins than the primary lipid bilayer, wherein the secondary lipid bilayer comprises a different lipid diffusion coefficient than the primary lipid bilayer, or wherein the secondary lipid bilayer comprises a different amount of cholesterol than the primary lipid bilayer.

106. The modified lipid bilayer of claim 100, wherein the one or more secondary lipid bilayer comprises substantially stable parameters within the primary lipid bilayer.

107. The modified lipid bilayer of claim 100, wherein the one or more secondary lipid bilayer does not comprise substantially stable parameters, and further wherein the secondary lipid bilayer and the primary lipid bilayer and/or components within the secondary and primary lipid bilayers diffuse into the other lipid bilayer.

108. The modified lipid bilayer of claim 100, wherein the one or more secondary lipid bilayer comprises a plurality of secondary lipid bilayers.

109. The modified lipid bilayer of claim 108, wherein the plurality of secondary lipid bilayers comprises a density of from about 144 to about 2200 or more secondary lipid bilayers per square centimeter of primary lipid bilayer.

110. A chimeric lipid bilayer comprising, a primary lipid bilayer and one or more secondary material in one or more region, wherein the one or more region of the secondary material is controllably localized within the primary lipid bilayer.

111. The chimeric lipid bilayer of claim 110, further wherein the primary lipid bilayer and the one or more region of secondary material are not separated by any physical barrier.

112. The chimeric lipid bilayer of claim 110, wherein the primary lipid bilayer is selected from the group consisting of: a supported lipid bilayer, a tethered lipid bilayer, a polymer-cushioned lipid bilayer, a lipid bilayer comprising proteins in a proteo-lipidic mixture, and a hybrid lipid bilayer comprising an outer lipid layer and an inner self-assembled monolayer.

113. The chimeric lipid bilayer of claim 110, wherein the one or more secondary material comprises one or more of: a cell, a protein, a glass bead, a latex bead, a bilayer coated bead, a membrane compatible amphiphilic polymer, a nanocrystal, a colloid, a quantum-dot material, a metal, a metal bead, or a polymerizable precursor molecule.

114. The chimeric lipid bilayer of claim 110, wherein the one or more secondary material comprises a plurality of secondary materials and a plurality of regions of secondary materials.

115. The chimeric lipid bilayer of claim 114, wherein the plurality of regions of secondary materials comprises a density of from about 144 to about 2200 or more secondary materials per square centimeter of primary lipid bilayer.

116. The lipid bilayer of claim 100 or 110, wherein the modified lipid bilayer or the chimeric lipid bilayer comprises an array for detecting or classifying one or more environmental moiety, wherein the one or more refunctionalization component binds to or otherwise indicates the presence of the one or more environmental moiety.

117. The lipid bilayer of claim 116, wherein the environmental moiety comprises one or more of: a bacteria, a bacterial toxin, a virus, a prion, a fungus, a fungal toxin, or a chemical agent.

118. The lipid bilayer of claim 116, wherein the environmental moiety comprises one or more of: *Bacillus anthracis*, *Clostridium botulinum*, *Clostridium botulinum* toxin, *Yersinia pestis*, *Variola* major, *Francisella tularensis*, Hemorrhagic fever, a Filovirus, an Arenoviruses, Ebola virus, Marburg virus, Lassa virus, Machupo virus, a Hanta virus, *Coxiella burnetii*, a brucellosis causing bacterium, epsilon toxin of *Clostridium perfringens*, a Salmonella species, *Escherichia coli* 0157:H7, Shigella,

Burkholderia mallei, *Burkholderia pseudomallei*, *Chlamydia psittaci*, ricin toxin, Staphylococcal enterotoxin B, *Rickettsia prowazekii*, a viral encephalitis virus, an alphavirus, Venezuelan equine encephalitis virus, Eastern equine encephalitis virus, Western equine encephalitis virus, a flavivirus, St. Louis encephalitis virus, *Vibrio cholerae*, *Vibrio cholerae* toxin, *Cryptosporidium parvum*, Nipah virus, distilled mustard, Lewisite, mustard gas, nitrogen mustard, phosgene oxime, ethyldicholoarsine, Lewisite 1 (L-1), Lewisite 1 (L-2), Lewisite 1 (L-3), methyldichloroarsine, mustard/Lewisite, phenodichloroarsine, sesqui mustard, arsine, cyanogen chloride, hydrogen chloride, hydrogen cyanide, chlorine, diphosgene, cyanide, nitrogen oxide, perfluororisobutylene, phosgene, red phosphorous, sulfur trioxide-chlorosulfonic acid, teflon and perfluororisobutylene, titanium tetrachloride, zinc oxide, Agent 15, BZ, canniboids, fentanyls, LSD, phenothiazines, cyclohexyl sarin, GE, sarin, soman, tabun, VE, VG, V-gas, VM, VX, bromobenzylcyanide, chloroacetophenone, chloropicrin, CN in benzene and carbon tetrachloride, CN in chloroform, CN and chloropicrin in chloroform, CR, CS, adamsite, diphenylchloroarsine, diphenylcyanoarsine, or a fusarium toxin.

119. The lipid bilayer of claim 116, wherein the refunctionalization component comprises an antibody against the environmental moiety, a specific protein which selectively binds to or otherwise indicates the presence of the environmental moiety, a specific membrane protein which selectively binds to or otherwise indicates the presence of the environmental moiety, a specific membrane lipid which selectively binds to or otherwise indicates the presence of the environmental moiety, or a specific chemical element or compound which selectively binds to or otherwise indicates the presence of the environmental moiety.

120. A kit for detecting or classifying one or more environmental moiety, the kit comprising a lipid bilayer of claim 116 and one or more of a container for containing the lipid bilayer, packaging material, or instructions for using the lipid bilayer for environmental monitoring.

121. The lipid bilayer of claim 100 or 110, wherein the modified lipid bilayer or the chimeric lipid bilayer comprises an array for detecting or identifying one or more pathogen in an organism, wherein the one or more refunctionalization component

binds to or otherwise indicates a presence of the one or more pathogen or of one or more pathogen-related moiety.

122. The lipid bilayer of claim 121, wherein the pathogen comprises one or more of: a bacteria, a virus, a prion, a fungus, or an infectious parasite.

123. The lipid bilayer of claim 121, wherein the one or more pathogen-related moiety comprises one or more of: an antibody of the organism against the one or more pathogen, a non-organism byproduct of the one or more pathogen, or a moiety produced by the organism in response to the one or more pathogen.

124. A kit for detecting or identifying one or more pathogen in an organism, the kit comprising the lipid bilayer of claim 121 and one or more of a container for containing a lipid bilayer, packaging material, or instructions for using the lipid bilayer for detecting or identifying the one or more pathogen.

125. The lipid bilayer of claim 100 or 110, wherein the modified lipid bilayer or the chimeric lipid bilayer comprises an array for detecting or identifying one or more nucleic acid sequence in one or more genome, wherein the refunctionalization component binds to or otherwise indicates the presence of the one or more nucleic acid sequence.

126. The lipid bilayer of claim 125, wherein the one or more nucleic acid sequence indicates a presence of one or more disease in an organism which comprises the one or more genome.

127. The lipid bilayer of claim 125, wherein the disease is a congenital disease.

128. The lipid bilayer of claim 125, wherein the one or more nucleic acid sequence comprises a plurality of nucleic acid sequences.

129. The lipid bilayer of claim 125, wherein binding of the one or more nucleic acid sequence identifies one or more organism comprising the one or more genome of the one or more nucleic acid.

130. A kit for detecting or identifying one or more nucleic acid in one or more genome, the kit comprising a lipid bilayer of claim 125 and one or more of a container for containing the lipid bilayer, packaging material, or instructions for using the lipid bilayer for detecting or identifying the one or more nucleic acid.

131. The lipid bilayer of claim 100 or 110, wherein the modified lipid bilayer or the chimeric lipid bilayer comprises an array for detecting or identifying one or more drug within one or more organism, wherein the one or more refunctionalization component binds to or otherwise indicates a presence or prior presence of the one or more drug within the organism.

132. The lipid bilayer of claim 131, wherein the one or more drug comprises one or more of: a cannaboid, cocaine, a barbiturate, methaqualone, sopor, parest, quaalude, mecquin, a benzodiazepine, chloral hydrate, phencyclidine, LSD, mescaline, peyote, psilocybin, DMY, DET, psilocyn, an amphetamine, an amphetamine derivative, heroin, codeine, morphine, an opiate, meperidine, hydromorphone, methadone, methamphetamines, or phenmetrazine.

133. The lipid bilayer of claim 131, wherein the organism comprises a human.

134. The lipid bilayer of claim 131, further comprising wherein the presence or prior presence of the one or more drug is detected or identified through examination of one or more of: blood, saliva, hair, skin, or mucus of the one or more organism.

135. A kit for detecting or identifying one or more drug or the prior presence of one or more drug within one or more organism, the kit comprising the lipid bilayer of claim 131 and one or more of a container for containing the lipid bilayer, packaging material, or instructions for using the lipid bilayer for detecting or identifying the one or more drug.

136. The lipid bilayer of claim 100 or 110, wherein the modified lipid bilayer or the chimeric lipid bilayer comprises an array for identifying the effect or efficacy of one or more putative therapeutic or preventative drug on one or more

organism, wherein the one or more refunctionalization component binds to or otherwise indicates the effect or efficacy of the putative drug.

137. The lipid bilayer of claim 136, wherein the refunctionalization component comprises one or more moiety from the organism which is capable of interacting with one or more infectious agent or one or more product of one or more infectious agent.

138. The lipid bilayer of claim 137, wherein the one or more putative drug binds to or alters the one or more infectious agent.

139. The lipid bilayer of claim 137, wherein the one or more putative drug binds to or alters the one or more moiety of the organism.

140. A kit for identifying the effect or efficacy of one or more therapeutic or preventative drug on one or more organism, the kit comprising the lipid bilayer of claim 136 and one or more of a container for containing the lipid bilayer, packaging material, or instructions for using the lipid bilayer for identifying the effect or efficacy of the one or more drug.